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Disciplines

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Physical Activity for Elderly Persons with Cognitive Impairment

Erin Wixson, Pacific University, November 14, 2008

Critically Appraised Topic (CAT)

Focused question

What evidence is available to confirm the effectiveness of using physical activity as an intervention to maintain or slow cognitive decline in individuals with existing cognitive impairments (i.e. Dementia, MCI, and Alzheimer's). What is the effectiveness of implementing physical activities in slowing cognitive decline within these individuals within occupational therapy treatment?

Clinical Scenario

Cognitive impairment affects millions of Americans within the aging population; with the prevalence of impairment continuing to increase with age. Current research from the National Institute on Aging suggests that 38% of people age 85 years and older have some degree of cognitive impairment short of the label of dementia. The most common form of dementia, Alzheimer's Disease is a major health problem, affecting 4 million aging adults. By 2050, 13.2 million Americans are expected to be living with Alzheimer's Disease (NIA, 2008). Increasing cognitive impairment within this aging population not only affects the person diagnosed, but also their family and caregiver's who experience increased burden. Accompanying the decline in cognition is memory loss, impaired thought processes and problems with language. Caring for older adults with advancing dementia is costly; up to 100 billion dollars every year. Effective treatment techniques are needed to help increase the amount of time this group may live without significant support and help these older adults maintain overall health and well-being.

Individuals diagnosed with cognitive impairment have unique needs that health care professionals need to be aware of when evaluating and treating this population. Currently, there are limited empirically supported occupational therapy treatment techniques that have been shown to maintain cognitive function for longer or slow cognitive decline in aging adults with existing cognitive impairment. More research and exploration of literature is needed to support the use of current therapy techniques.

Physical activity programs have shown to have multiple positive effects on older adults including improved cardiorespiratory performance, functional capacity and mobility, and psychosocial wellbeing. There is some evidence supporting the idea that engaging in physical activity can also improve cognition in this population. Reviewing the available literature has shown that rehabilitation professionals are currently using physical activity as an intervention practice for older individuals with varying degrees of existing cognitive impairment. The type of activity, intensity, frequency, and duration of activity is most often dependent on the level of impairment, and the age and physical capacity of

the individual for engagement in aerobic activity. The patient that is considered to be the most likely to participate in this type of intervention would be an older adult with existing cognitive impairment that most likely exhibits deficits in executive function, memory, may experience agnosia, aphasia, and/or apraxia. In order for successful participation, the older individual would also need to be physically well enough to engage in physical activities and not have any other health related issues that could make it dangerous for them to participate (i.e. heart condition). The participants should also be able to follow directions for an activity. Individuals with severe dementia or advanced form of Alzheimer's Disease would not be appropriate for this intervention approach.

Clinical Bottom Line:

There is mixed evidence recognizing physical activity (also referred to as exercise or aerobic activity within this review) as an effective treatment option for older adults with existing cognitive impairment. Several studies have reported on the positive effect of physical activity improving rates of oxygen consumption post test and increase in overall cardiorespiratory fitness levels for older adults. With this, the results of this study could affect occupational therapy practice in that they emphasize the use of aerobic training for older adults to maintain aerobic capacity even if not yet confirmed to maintain or improve cognitive performance.

There is also some evidence that physical activity may have an impact on certain areas of cognition such as memory and reaction time.

Physical activity interventions, if found to be effective for aging populations could be considered a reasonable alternative therapy in occupational therapy practice. Most interventions described within the included studies require limited resources to complete and could be done in the clinic. There is evidence that even small increases in aerobic training are required to see some positive effects on performance (Kramer et al., 1999). This may prove to be significant for older adults where opportunity and availability for aerobic exercise may be limited.

Summary of Key Findings

--Analysis of assessment data of a level III before and after design by Kramer, Hahn, and Cohen (1999), yielded some effect of intervention of exercise on cognitive performance more specifically with rates of reaction time for these participants. Significant effect of aerobic activity was noted in the area of aerobic capacity. Aerobic capacity-VO2 max increased significantly for older adults who participated in aerobic activity in this study. Researchers did not rule out the possibility of long-term effects of aerobic exercise on reaction time performance of sedentary older adults even though the evidence of this study did not show that. Researchers discussed attempting further research with different exercise protocols or different performance (cognitive) measures.

--Scherder (2005) a level I, RCT studied another aspect of cognition and addressed the beneficial influence of physical activity on episodic memory in older adults (Scherder, 2005). This research study concluded that physical activity has a selective effect on cognition but findings should be taken with caution because of the small sample size (N=43). Scherder compared a control with two different types of intervention; walking

and hand to face movements for 30 minutes/day 3 days/week for 6 weeks.

Results of this study showed better performance of treatment groups in post tests for concept formation, abstract thinking, and perceptual motor functioning. There was no significant effect of physical activity intervention on memory. Scherder also found that treatment effects can not be maintained in periods without treatment.

--Palleschi (1996), tested elderly patients with Senile Dementia of Alzheimer's Type (SDAT) using neuropsychological tests (pre-test) primarily focused on verbal span and attention. Intervention included a 3-month exercise program followed by a post test with the same tests. There was no control group for this study.

The results of the study show that the aerobic training in this study significantly improved cognitive functions in the elderly participants affected by SDAT. Although it is important to consider the small sample size when measuring power and effect size (N= 15).

Research concluded that long term exercise training can help to maintain at least the residual functioning capabilities of elderly patients with SDAT. The researchers also concluded that exercise can deter from isolation and immobilization led by cognitive damage.

-- A level I RCT study tested the effects of aerobic training on cognitive performance of older adult's primarily using reaction time (RT) measures.

In this experimental study, Madden, Blumenthal, Allen, and Emery (1989) concluded that the older adults within the experimental groups improved their level of aerobic capacity but there was no shown exercise-related improvement in cognitive tasks, especially in reaction time (RT tasks). Two interventions were used along with a control group:

Group 1- 10 min warm-up, 30 min of continuous bicycle ergometry at an intensity rate that maintained participants heart rate within assigned range, 15 min brisk walking or 5 min of arm ergometry (participants were given the choice), and 5 min cool down.

Group 2-performed 60 min of supervised yoga 2x/week for 16 weeks. *Group 3*- Control Researchers did not rule out the possibility of long-term effects of aerobic exercise on reaction time performance of sedentary older adults even though the evidence of this study did not show that. Researchers discussed attempting further research with different exercise protocols or different performance (cognitive) measures.

-- A case-control study with a large sample of participants attempted to find a link between older adults who report increased physical activity during leisure time activities and the rate of progression of white matter lesions (known to be present within individuals with increasing cognitive impairment). No evidence was found that higher levels of physical activity decreased the rate of WML changes (Podewils, 2007).

Summary of Qualitative Studies:

Not included

Inclusion Criteria

Evidence based reviews, published reports, randomized Control Trials (RCT), cohort, single case design, before and after, case-control, cross-sectional designs

Participants within studies were older adults who engage in physical activity

Exclusion Criteria

Expert Opinion

Dissertations

Written before 1988

Search Strategy

Source	Search Terms	Inclusion/Exclusion	Notes
EBSCO HOST (CIDHL)	Dementia <u>and</u> physical activity Dementia <u>and</u> physical activity dementia <u>and</u> motor activity cognition <u>and</u> physical activity <u>and</u> older adults Exercise and Older adults and cognition	none limit full text Limit full text Limit full text	none 53 returned
OT Search	Dementia		344 returned abstracts for 1- 80
EBM Reviews	Dementia <u>and</u> physical activity Dementia <u>and</u> exercise Cognition Cognition <u>and</u> physical activity	Systematic reviews	Able to find a systematic review. Searched for relevant articles and authors
EBSCO HOST	Author search: Heyn Heyn <u>and</u> exercise Rolland Pillard	Authors Keyword	296 returned 0 returned
Medline OVID	Heyn Cognition and physical activity and older adults	Authors Full text	7 returned 26 returned

Databases and Sites Searched

Medline OVID, EBSCO HOST, OT Search, The Cochrane Library, EBM Reviews, PsychINFO, CINAHL

Quality Control/Peer Reviewed Process

Developed search terms Reviewed relevant literature Completed CAP worksheet for each chosen article

Results of Search

Level of Evidence	Study Design	Number of Articles selected
I	Systematic Reviews, meta analysis, RCT	2
II	Non randomized Case Control	1
III	Non-randomized before and after	2
IV	Descriptive	0
V	Case Reports Expert opinion	0
	Qualitative Studies	0
		Total = 5

Best Evidence

Summary of Best Evidence

Aim of Study

The purpose was to investigate whether greater aerobic fitness in older adults would result in selective improvements in executive functions such as planning and working memory. Anaerobic exercise was investigated as an alternative treatment.

This purpose relates to the research question in that it focuses on cognitive functioning in older adults and the effect of aerobic activity on performance. This research focuses on older adults without known cognitive impairment, and even though the research question is primarily focused on physical activity and its effect on older adults with cognitive impairments, and it is beneficial to study groups of older adults as a comparison and frame of reference. It addresses the question of the benefits of aerobic activity for this group and whether they can be applied to a group of the same age but with pre-existing cognitive impairment.

Intervention investigated

Each of the 124 participants were given the cardiorespiratory test along with the 3 cognitive tests. The study specified that the physical activity intervention was conducted over a 6 month period, no description was given in research as to activity frequency, intensity and duration. At the end of the 6 month period, the participants were tested again using the same cardiorespiratory and cognitive tests.

Outcome measures

1. Cardiorespiratory Test
2. Task Switching
3. Response Compatibility
4. Stopping

Results

The researchers of this study stated that the results were significant, however there was no data given on level of significance. Subjects in the walking group showed improvements in max rate of oxygen consumption compared to the stretching/toning group.

Cognitive Tests

1. Task switching-walking group showed faster reaction time switching between tasks following treatment
2. Response Compatibility- The distracter interference effect decreased for the walking group following treatment.
3. Stopping Test- The reaction time to “stopping” tasks decreased for the walking group following treatment.

Original authors and conclusions

(Kramer, Hahn, & Cohen, 1999)

The study concluded that areas of the brain that are responsible for executive functioning, primarily the prefrontal and frontal cortex were sensitive to aerobic exercise treatment.

Aerobic activity improved performance on the assigned cognitive tests.

The results could be considered significant in that the researchers found that the differences found required only small increases in aerobic fitness training. This may prove to be significant for older adults where opportunity and availability for aerobic training may be limited.

Critical Appraisal:

Validity

Difficult to find validity measurements for cognitive measures used. The researchers did not specify in the study where the measures originated. The Wechsler Intelligence test has a Task Switching subtest. Reliability for the Wechsler is .80

Results

Kramer et al. (1999) provides the best evidence as the benefits of aerobic activity improving cognitive performance in older adults. However, the absence of a control group makes it more difficult to show true effect of aerobic activity for this group and judge whether treatment alone is responsible for changes. The researchers failed to specify any other factors that could be affecting the participant's performance and did not control for co-intervention. There was no control for contamination and no specification of the location of intervention and environmental implications and factors. It seems the results of this study could be easily applied to OT practice further affirming the benefits of physical exercise for aging adult patients experiencing cognitive decline. The interventions; walking and stretching/toning exercise require limited resources to complete and could be done in the clinic. The duration of the treatment, 6 months would not be very realistic in most OT settings, because it is difficult to treat patients consistently for a 6 month treatment period.

Limitations of the studies appraised

Levels I, II, III

Absence of a control group

Researchers retesting using the same cognitive assessments. Not addressing practice effect. Cognitive measures part of a larger project manufactured by one of the researchers for this study, Blumenthal (in press at release of this article), limiting researchers ability to be subjective (Madden, 1989)

Potential measurement error in self-reports of physical activity by the participants. There is also the possibility for measurement error in the assessment of WML's on MRI (Podewils et al., 2007).

Limited information about the participants, how they were chosen, and current functioning level (Kramer, 1999).

Additional Limitations

Inexperience of the researcher

Lack of availability of some research materials-unable to access through school

Researcher only used 7 databases.

Implications of Research for Occupational Therapy Practice

This subject relates to occupational therapy practice in that it attempts to link exercise with slowing cognitive decline in older adults with existing cognitive impairment, a group treated by occupational therapists. Although there seems to be sufficient amount of literature on this subject, the studies reviewed in this paper fail to provide a strong argument to the effectiveness of physical activity as an intervention to slow cognitive decline in this group. This evidence should be acknowledged by occupational therapists when planning treatment sessions. There is however, important alternative evidence within these studies as to the alternative effects of treatment based physical activity aside from cognition for this group. One alternative aspect that was positively shown as an effect from this research is an increase in overall aerobic capacity.

Therapists may also explore the idea that positive performance responses from this group could be merely from the engagement in activities and this group could benefit from increased participation in daily activity opportunities instead of structured exercise programs.

Along with the resulting physiological effects of exercise, practitioners should also acknowledge the overall effect of physical activity on the well-being and overall self-perception of the older adult population, a group that research shows does not engage in enough physical activity throughout a typical day. In Madden et al. (1989) participants reported feeling better, having better mood, self confidence and greater life satisfaction after physical activity intervention.

Overall, this subject warrants further research with larger subject samples and use of control groups for direct comparison. Older adults with severe dementia need to be a study focus as this group continues to increase in number and few current occupational therapy intervention techniques are available.

Articles Selected for Appraisal

Forbes, D., Forbes, S., Morgan, D.G., Markle-Reid, M., Wood, J., Culum, I. (2008). Physical activity programs for persons with dementia. *The Cochrane Database of Systematic Reviews The Cochrane Collaboration*, 3.

Kramer, A.F., Hahn, S., Cohen, N.J., (1999). Aging, fitness, and neurocognitive function. *Nature*, 400(29), 418-419

Madden, D.J., Blumenthal, J.A., Allen, P.A., Emery, C.F. (1989). Improving aerobic capacity in healthy older adults does not necessarily lead to improved cognitive

performance. *Psychology and Aging*, 4 (3), 307-320.

Palleschi, L. (1996). Effect of aerobic training on the cognitive performance of elderly patients with senile dementia of Alzheimer type. *Archives of Gerontology and Geriatrics*, 22(1), 47-50.

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Other Resources used within this review

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